Remarks/Arguments:

Claims 13-23 are pending in the above-identified application. Claims 18 and 22 have been withdrawn from consideration. Claims 13-16, 18-21 and 23 are amended. Basis for these amendments may be found throughout the specification and in particular at paragraphs [0061] and [0062] of the translation.

Election/Restriction

In the Office Action, the Restriction and Election of Species Requirement was made final because it was asserted that "the limitations of claim 19 are disclosed in combination of prior art." Applicant traverses this restriction for two reasons. First, claim 18 does not depend from claim 19. Instead, it depends from claim 13. Furthermore, as set forth below, neither claim 13 nor claim 19 is subject to rejection under 35 U.S.C. § 103(a) in view of the cited references. Accordingly, the restriction of claims 18 and 22 is improper. As the restriction has been made final, Applicant will file a petition under 37 C.F.R. § 1.144 after receiving a Final Action or an Allowance in the above-identified application.

Specification Objection

The objection to the specification is overcome by the amendment to paragraph [0066]. The error in paragraph [0066] occurred during translation. Basis for this amendment may be found in the published PCT application no WO 2005/004166 at page 17, line 8. In view of this amendment, Applicant requests that the objection to paragraphs [0062] and [0066] of the specification be withdrawn.

The specification was also objected to under 35 U.S.C. § 112, first paragraph as failing to provide an adequate written description of the invention and as failing to adequately teach how to make and/or use the invention and claims 13-16, 18-21 and 23 were rejected under 35 U.S.C. § 112, second paragraph as failing to particularly point out and distinctly claim the invention. Applicant requests reconsideration of this objection and rejection. In particular, in the Office Action: 1) the statement that f^{nom} represents "a predetermined amount of energy" was found to be objectionable; 2) the "level of subcriticality (r_0)" was objected to as having been defined incorrectly in the specification; 3) the value of the "negative fluctuations of the power of the reactor in the normal operating mode of the reactor" recited in claims 14 and 20 were objected to as "not being determined in application;" and 4) the expression "much greater

than possible negative fluctuations of the power of the reactor in the normal operating mode of the reactor," in claim 20 was deemed to need further explanation.

Item 2) is corrected by the amendment to the specification described above. Item 3) is corrected by amending claim 20 to change "much greater" to "greater." Regarding items 1) and 4), Applicant notes that f^{nom} is a fraction of the core energy and not an absolute energy value, as disclosed in paragraph [0062] and equation 4. In addition, f^{nom} is proportional to r_0 and dependent on E_p^{nom} which implies that the determination of f^{nom} and E_p^{nom} are done coherently at the very beginning but still keeping in mind that $E_p^{nom} = E_p^{\max} + \Delta E_p$, with ΔE_p being a positive value. In other words, f^{nom}, E_p^{nom} and I_p^{nom} are all linked and adopted from the very beginning according to the total reactor power to be produced. Indeed, the power represented by f^{nom} is known precisely only at the very beginning since, in the ACS (Accelerator Coupled System), it is linked to the reactor power evolution and evolves according to its fluctuations around the initial f^{nom} value, providing intrinsic safety features of the reactor core through the "Y_n effect" ("Doppler-like effect"). Thus, while the energy represented by f^{nom} may not be a predetermined value, the fraction f^{nom} is a predetermined value.

Applicant understands that the levels of negative or positive power fluctuations are difficult to divine as these levels are inherent characteristics of a specific reactor core, and are going to be known precisely only when the specific reactor core is designed/constructed. In the subject specification, however, it is emphasized that the "Y_n effect" of the neutron yield can be artificially increased by dedicated optimization of the spallation target geometry, i.e. a particular geometry can be adopted to vary in the expected/allowed range of the power fluctuations of the reactor core through the f^{nom} coupling. Thus, from the teachings of the specification, one of ordinary skill in the art would be able to provide a suitable spallation target geometry for a specific reactor core without undue experimentation, once the core is designed/constructed.

Accordingly, the objections to the specification under 35 U.S.C. § 112, first and second paragraphs have been overcome.

Claims 13-17, 19-21 and 23 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kadi et al in view of Knief. Applicant requests reconsideration of this rejection. In particular, neither Kadi et al., Knief nor their combination disclose or suggest: "adjusting the number of external neutrons depending on operating fluctuations of the nuclear reactor power by acting on the energy of the charged particles, (Ep) generated and accelerated by the accelerator, wherein the accelerator is configured to be controlled by the particle energy with a constant beam intensity."

Kadi et al. describe an accelerator driven system (ADS) in which the nominal charged particle energy is selected to be above approximately 1GeV, as shown in Fig 15 and described on pages 108-109, to provide the maximum energy gain. Once this value is know, it is fixed and the ADS is governed by changing the accelerator's current but not the incident energy of the accelerated charge particles, as required by the subject invention as defined by claims 13 and 19.

While many of the formulas used in the subject specification are also found in Kadi et al., this reference does not disclose or suggest adjusting the number of external neutrons acting on the charged particle energy with constant beam intensity, depending on the operationg power fluctuations of the nuclear core. Fig. 15 of Kadi et al. is used only to demonstrate how the energy gain depends on the incident particle energy. It does not disclose or suggest how the coupling between the particle accelerator and the reactor core should be governed during the operation of the reactor. Furthermore, Kadi et al. do not disclose or suggest "acting on the energy (E_p) of the charged particles generated and accelerated by the accelerator for adjusting the number of external neutrons depending on operating fluctuations of the nuclear reactor power" as required by claim 19. Claim 1 includes a similar recitation.

Kadi et al. at page 115, with reference to Fig 15, disclose that "the energy gain is well understood and that, not only is it independent of the proton beam intensity, but it is also independent of the beam kinetic energy if above about 900 MeV." In the subject invention, as defined by claims 1 and 19, this energy gain stability would be lost if the neutron production were energy dependent, as required by claims 1 and 19 of the subject invention. In the ACS system defined by claims 1 and 19, the coupling of the reactore core power to the accelerated charged particle energy provides the intrinsic stabilization of the power fluctuations of the reactor core. Furthermore, as set forth in claim 23, the neutron production dependence on

charged particle energy can be incremented further through a dedicated design of the spallation target geometry.

Moreover, Kadi et al., at page 100, state that their ADS operates "in a non-self sustained chain reaction mode." This means that the system is completely decoupled as "ADS provides decoupling of the neutron source from the fissile fuel" (page 100). This is contrary to the present invention in which coupling is established through the energy variation of the accelerator charged particles with respect to the power variations of the reactor core.

In the Office Action, it is asserted that Kadi et al. disclose the subject invention, in part because they disclose "a neutron generator device using a beam of accelerated charged particles ..., the neutron beam consuming a predetermined amount of energy f^{nom} produced by the core...." This assertion shows a basic misunderstanding of the subject invention. The term f^{nom} is not a predetermined *amount* of energy but a predetermined *fraction* of the energy produced by the core. The claims have been amended to correct this misperception. Basis for this amendment may be found in paragraph [0062] and in particular, equation 4.

Knief, which concerns critical reactors, was cited as describing the use of feedback to control of generation of neutrons. It is noted, however, that the neutrons generated in Knief are internal neutrons, not external neutrons. It is also noted that the reasons for controlling the internal neutrons in Knief is not the same as in the subject invention as Knief is concerned with preventing runaway reactions which are less likely in a system according to the present invention as the ACS reactor of the present invention is sub-critical.

Furthermore, the reason for combining Knief with Kadi et al. is not based on substantial evidence. Instead, it is a conclusory statement made with hindsight gained from the subject invention. As described above, Knief and Kadi et al. describe completely different systems, one which needs an external neutron source and one which does not; one which requires control of internal neutron generation to prevent runaway reactions and one which does not. Furthermore, Kadi et al. teach that it is undesirable to control the energy of the charged particles to adjust the number of external neutrons, as required by claims 1 and 19 of the subject invention, because Kadi et al. teach that the energy of the charged particles should be above about 1GeV to ensure energy gain stability. If Kadi et al. were to control the energy of the charged particles, they would lose this energy gain stability. Finally, at page 100, Kadi et

al. teach that their ADS "provides a decoupling of the neutron source ... from the fissile fuel...." This decoupling would be lost if Kadi et al. were combined with Knief as proposed in the Office Action.

For the reasons set forth above, claims 13 and 19 are not subject to rejection under 35 U.S.C. § 103(a) in view of Kadi et al. and Knief. Claims 14-18 depend from claim 13 and claims 20-23 depend from claim 19. Accordingly, these claims are not subject to rejection under 35 U.S.C. § 103(a) in view of Kadi et al. and Knief. Furthermore, because claims 13 and 18 are not obvious in view of Kadi et al. and Knief, they represent a common inventive concept and the restriction of claims 18 and 22 as representing a separate invention is improper and should be withdrawn.

In view of the foregoing amendments and remarks, Applicants request that the Examiner reconsider and withdraw the objections to the specification, the objections to the claims, the rejection of claims 13-17, 19-21 and 23 and the restriction of claims 18 and 22.

Respectfully submitted,

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